NOTES ON THE ANALYSIS OF AGRICULTURAL PRODUCTS.

BY J. T. WILLARD, STATE AGRICULTURAL COLLEGE EXPERIMENT STATION.

[*Abstract.*]

The author described several devices which he has found especially useful in the analysis of certain agricultural products. Desiccation in a current of dry hydrogen may be conveniently accomplished by putting the samples in wide-mouthed weighing-bottles, and setting these in a small copper box, which is closed air-tight by wide corks in the top and is connected by glass tubing with the hydrogen generator. This copper box is heated in the water oven. The latter may be raised to the full temperature of the boiling water by fitting a board into the open side of the oven, inside the ordinary door. A T-tube, with two of the openings sealed and having two to six short upright branches, is very convenient for connecting drying-tubes with an aspirator or with a source of dry hydrogen. The drying-tubes are like short, wide test-tubes with a short piece of glass tubing sealed into the bottom. This tubing is of the same size as that used for the upright branches of the connecting tube. The two are connected by a perforated cork. When necessary, the drying-tube may be closed by a cork bearing a short piece of glass tubing drawn to a small opening.

The author determines the water, ether extract and crude fiber in a single sample of a fodder by drying the substance as above described, inclosing it in smooth filter-paper folded into a sack-like form, extracting with absolute ether, and estimating the fiber in the residue.

The foaming, which usually gives so much trouble when a fodder is boiled with the acid and the alkali in the determination of fiber, may be completely controlled by directing an air-blast upon the surface of the boiling liquid in the Erlenmeyer flask. The blast of air may be obtained by supplying the flask with a suitable jet tube, which is connected directly with a source of compressed air; or, as the flask is connected with an inverted condenser, the blast may be *drawn* in by connecting a pump with the upper end of the condenser.

NOTE.—The substance of the paper of which the above is an abstract will be found in the annual report for 1889, of the Kansas State Agricultural College Experiment Station.

AMMONIA AND NITRIC ACID IN RAIN-WATERS COLLECTED AT THE AGRICULTURAL COLLEGE.

BY PROF. G. H. FAILYER, STATE AGRICULTURAL COLLEGE.

[*Abstract.*]

The full and complete results upon this subject are contained in the annual report of the Experiment Station of the College for the year 1889. The analytical work has been largely in the hands of Messrs. J. T. Willard and C. M. Breese, of the chemical department of the College.

The rain has been collected in a gauge the five-thousandth part of an acre in area. This gauge has been in use since March 1st, 1886. The water is measured in litres, and a sample taken for analysis.

The first year the nitrogen existing as ammonia and nitric acid was determined at one operation as ammonia by reducing the nitrates to ammonia by a copper-zinc couple made after W. M. Williams's directions, and nesslerized after distillation. Since March 1st, 1887, the ammonia and the nitric acid have been determined sepa-

rately. A measured volume is made alkaline, and distilled; the distillate is then nesslerized: this gives the ammonia. For nitric acid an additional volume is measured into the flask, and the ammonia boiled off. The residual liquid is made slightly acid by $H\,Cl$, reduced by the copper-zinc couple, made alkaline, distilled, and nesslerized. The ammonia now obtained is that resulting from the reduction of nitrates and nitrites.

In Table I is shown, by months, the results for the three years ending February 28th, 1889. The columns under nitrogen give the nitrogen in both ammonia and nitric acid. Ammonia is given as NH_3; nitric acid as HNO_3.

In Table II are given some of the extreme—both greatest and least—proportions between the rain-water and the compounds under consideration.

TABLE I.—SUMMARIES FOR THREE YEARS.

MONTHS.	RAINFALL.						NITROGEN.			AMMONIA.				NITRIC ACID.			
	1886–7.		*1887–8.*		*1888–9.*		*Grams per acre.*			*Parts per million.*		*Grams per acre.*		*Parts per million.*		*Grams per acre.*	
	No.	Inches.	No.	Inches.	No.	Inches.	1886–7.	1887–8.	1888–9.	1887–8.	1888–9.	1887–8.	1888–9.	1887–8.	1888–9.	1887–8.	1888–9.
March	7	2.00	3	.39	7	2.04	121.4	71.7	160.4	1.81	.76	71.6	158.5	1.45	.64	57.4	134.3
April	8	3.95	6	2.24	8	1.33	106.1	156.4	165.9	.70	1.18	161.1	160.8	.47	1.11	106.8	150.5
May	7	4.53	5	2.66	10	2.96	217.9	154.7	141.8	.46	.36	125.8	109.8	.84	.76	229.7	231.1
June	6	4.88	13	4.95	12	5.91	100.2	187.4	194.2	.27	.23	140.0	137.6	.64	.60	324.4	364.7
July	3	2.92	6	.35	7	4.02	187.4	37.8	122.8	.71	.23	25.3	94.7	2.13	.49	76.5	201.6
August	11	1.89	10	6.05	8	4.62	115.4	287.7	186.9	.37	.29	229.7	138.6	.72	.69	443.4	327.3
September	6	1.04	8	6.39	3	2.86	46.3	249.2	174.0	.34	.38	222.4	110.5	.45	1.28	297.3	373.4
October	3	2.18	2	2.13	5	2.74	84.2	52.2	177.3	.21	.62	44.7	174.3	.32	.54	69.2	151.6
November	1	1.08	2	.43	2	.48	65.5	117.7	60.0	2.67	1.19	117.5	58.2	1.71	1.12	75.5	54.4
December	4	1.43	5	.80	3	.98	50.8	71.0	129.7	.93	1.36	75.6	137.0	.48	.76	39.3	76.2
January	2	.18	3	.44	2	.73	20.1	33.4	43.6	.77	.66	34.7	49.2	.49	.19	21.9	14.1
February	3	.89	6	2.67	3	.31	107.4	119.5	70.2	.41	2.14	111.5	67.3	.46	2.11	124.8	66.4
Totals	61	26.97	69	29.50	70	28.98	1,222.7	1,538.7	1,626.8	....	....	1,359.9	1,396.5	....	....	1,866.2	2,145.6
Means	.....	....	.....	....	.....	....	....	....	....	.4498	.4703	....	....	.6173	.7226	....	....

TABLE II.—SHOWING PROPORTION OF AMMONIA AND NITRIC ACID IN SOME RAINS.

LITRES PER ACRE.	PARTS PER MILLION.	
	Ammonia.	*Nitric acid.*
850	14.50	4.84
10,075	4.30	7.04
1,750	12.60	8.33
3,500	9.10	2.56
7,973	9.10	2.71
9,750	4.35	3.30
3,900	6.10	2.82
925	2.85	3.95
28,200	.04	.51
312,730	.07	.31
121,900	.00	.38
112,500	.04	.64
206,250	.19	.38
26,925	.26	.16
10,750	.27	.25
62,250	.69	.13

ADDITIONS TO KANSAS BIRDS.

BY COL. N. S. GOSS, TOPEKA.

Frosted Poor-will, *Phalænoptilus nuttalli nitidus.* A summer resident. Taken at Neosho Falls and Manhattan.

Little Brown Crane, *Grus canadensis.* This bird was omitted by oversight from the catalogues, and subsequent lists as reported to this society. It is not uncommon during migration.

OCTOBER, 1889.

ARTESIAN WELLS IN KANSAS, AND THE CAUSES OF THEIR FLOW.

BY ROBERT HAY, F.G.S.A., JUNCTION CITY.

[*Abstract.*]

This paper mentions twelve localities where there are artesian wells in Kansas. The Larned well has the largest flow—nearly three hundred gallons per minute—and gives out a strong brine. There is a group of wells in Hamilton county, and another group in Meade county, available for irrigation.

The principal feature in the paper is the discussion of the causes of artesian flow. The conditions resulting in the usual form of artesian wells, which are exemplified by those mentioned above, are a porous rock, having an out-crop to catch the rainfall of a region of some extent, and dipping toward the well with a layer of clay, clay-shale, or other impervious material, above and below it, so that the water of the porous stratum is inclosed as in a pipe, and it rises to the surface when the well-driller pierces the upper impervious stratum. The cause of the rising of the water in these conditions is *hydrostatic pressure*, just as it is in the rising of the water to the tops of high buildings in the water service of a city.

A well at Mound Valley, in Labette county, was described as illustrating the rise of water to the surface without the necessary hydrostatic pressure, the column of water being held up by an outflow of natural gas. This the writer termed *gas-pressure*, which in this case is an efficient cause of artesian flow, and which in other cases is probably a help.

Wells in Morton county and in Pottawatomie county were described, having